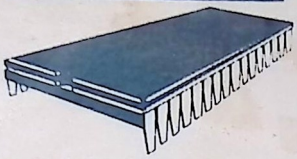
PACE



ROM based software

COMMSTAR

ROM BASED INTELLIGENT
COMMUNICATION FACILITY
FOR ELECTRON

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Preface.

The Acorn Electron RS423 cartridge adds the following facilities to the Electron microcomputer:

Serial RS423 interface.
Serial Printer capability
Control of equipment with serial interfaces
Terminal emulation using the applications software socket built into the cartridge.

The basic facilities are accessed using simple Basic or machine code system commands which are compatible with BBC Basic.

The cartridge is supplied with the Commstar Viewdata/Terminal emulations software already installed and this will allow you to access the vast majority of remote computer systems like Prestel, Telecom Gold etc. However, if your application is non-standard it is quite possible to write your own driver software which can then be operated from Tape or disc as usual, or placed in ROM and used instead of Commstar in the cartridge.

The first section of this manual describes the main functions of the cartridge itself including the Operating system calls and commands which may be used to control the RS423 port along with some details of the hardware design.

The remainder of the manual from Chapter 3 onwards refers purely to the Commstar software and its applications. If you are only interested in using the cartridge for logging onto bulletin boards or other remote systems we suggest that you ignore Chapters 2 for the time being.

CHAPTER 1

Getting Started

1.1 Installation.

The RS423 communications cartridge must be fitted to one of the cartridge slots provided on the Plus 1 interface. It is very easy to fit, just carry out the following operations :

1. Switch OFF the power to your Electron. Remember that if you disconnect your Electron from the power supply for any length of time you should remove the mains transformer from the wall socket.

2. Push the RS423 cartridge firmly into the selected slot on the Plus 1 with the label facing the front. The cartridge will only fit one way so that the cable exits from the left edge of the cartridge case when inserted correctly.

3. Connect the plug from the cartridge lead to the appropriate socket on your modem. If you are using the Nightingale modem, ensure that the gap in the metal surround of the plug is to the top when it is in place.

4. Switch on your Electron. To check that all is well type :

   *HELP<Return>

   You should see now see the message :

   Commstar nnnn

   where nnnn is the registration number. If this signature does not appear check once again that the cartridge is inserted correctly.

Warning : Never install or remove the RS423 cartridge while the power to the Electron computer is turned ON. Permanent damage may result.

1.2 User Registration

When the cartridge has been correctly installed the serial number displayed when you type *HELP should be filled in on your registration card which should then be returned to PACE immediately.

NO user support will be provided if this card is not returned! Please ensure also that this number is quoted in any correspondence.

Chapter 2

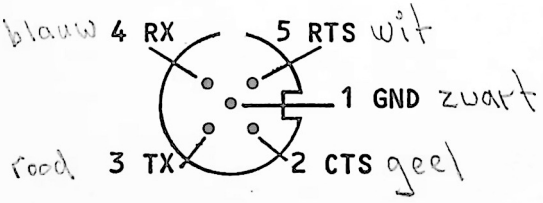
RS423 Applications.

2.1 Using a printer.

With the addition of the RS423 cartridge to the Electron Plus 1 it is now possible to use either a Serial or Parallel printer. If you are in doubt as to which printers are compatible with the RS423 interface you should consult your dealer.

In order to use a serial printer with the RS423 cartridge it will be necessary to adapt the serial cable to connect the two together. The cartridge is compatible with both the RS232c and V24 type interfaces but the way in which manufacturers wire their printers may vary.

If you need to make up your own cable refer to the diagram below. You will see that the RS423 lead is normally fitted with a 5-pin domino socket and the view below is shown looking into the plug with the pins towards you (notice that the gap in the metal plug surround is to the top of the diagram).



View looking into RS423 plug

It is normally possible to drive a serial printer with only three wires and the manner in which to make connections for most serial printers is as follows :

Electron RS423	Printer RS232c
GND	Pin 7
TX	Pin 3
CTS	Pin 20

2.2 Talking to other computers.

By using the RS423 cartridge it is possible to communicate with other computers. The purpose of this may be to act as a terminal to a mainframe computer or to access information on a remote system such as Prestel. In fact the whole purpose of the Commstar applications ROM which is normally provided with the RS423 cartridge is to allow the Electron to communicate with a whole range of remote computer/information systems.

However, all of the basic tools needed to write your own communications programs are provided within the Electron Operating System and can be access simply from Basic or assembly language.

2.2.1 A Simple BASIC terminal program.

The following program makes the Electron behave as a 'dumb terminal'. It takes characters typed at your keyboard and sends them to the RS423 interface and to the screen. It also reads characters coming into the RS423 interface and displays them on the screen.

There are five parts to the program

Lines 30-80 define the operating system calls which are used to set up the RS423 to receive and define the baud rates.

100-150 provides an endless loop which checks the keyboard for characters (110), if a key has been pressed it transmits it and then prints it to the screen (120). It then checks for an incoming character in the RS423 buffer (130) and if it finds a valid, printable character it displays it on the screen (140).

PROCxmit sets up the RS423 as the output stream (180) and sends the character in A% to OSWRCH

(190). It then redefines the screen as the output stream.

FNreceive (230) CALLs OSBYTE 145 to get a character from buffer 1 (RS423 receive buffer), masks the character to check for validity and if it is valid returns it as the function result value.

PROCscreen (300) sends the character in A% to OSASCI (310) to print it on the screen.

A summary of the new and changed OSBYTE calls is given in Apendix B to supplement the information provided in your Electron User Guide.

Listing 1.

```
 10 REM DUMB TERMINAL EMULATOR
 30 osbyte = &FFF4
 40 oswrch = &FFEE
 50 osasci = &FFE3
 60 *FX2,2
 70 *FX7,3
 80 *FX8,3
 90
100 REPEAT
110 key%=INKEY(0)
120 IF key%<>-1 THEN PROCxmit(key%)
130 character=FNreceive
140 IF character <> 0 THEN PROCscreen(character)
150 UNTIL FALSE
160
170 DEFPROCxmit(A%)
180 *FX3,7
190 CALL oswrch
200 *FX3,4
210 ENDPROC
220
230 DEFFNreceive
240 A%=145
250 X%=1
250 R%= USR osbyte
270 R%=(R% AND &1FF0000) / &10000
280 IF (R% AND &100) =0 THEN =(R% AND &FF) ELSE=0
290
300 DEFPROCscreen(A%)
310 CALL osasci
320 ENDPROC
```

2.3 Installing Application ROMs.

A single socket is provided inside the Electron RS423 cartridge which is designed to accept a ROM/EPROM of the types 2764, 27128 or 27256. To fit a suitable ROM remove the RS423 cartridge from the Electron and place it with the label upwards on a flat surface. Remove the two screws with a suitable screw driver (being careful not to lose them). The cartridge case will now come apart revealing the underside of the circuit board. The board should be gently removed from the case and turned over so that you can see the IC's and other components.

Normally the Commstar ROM will be visible in the 28-pin DIL socket and this must be removed if you wish to use your own ROM based software. This socket may contain any standard sideways ROM. If you fit a 27256 chip it will occupy sideways ROM positions. Any ROM should be fitted with the half-moon notch on the ROM facing towards the crystal (marked X1).

Having fitted the ROM reassemble the cartridge and fit it to the Plus 1. The ROM will appear in a higher priority position than the BASIC ROM and therefore if it is defined as a language ROM the Electron will default to this rather than BASIC when power is applied.

2.4 The RS423 Internal buffer.

Characters which are to be transmitted via the RS423 port are first stored in the RS423 output buffer. They are then transmitted as and when the receiving device is ready for them. This buffer is capable of holding up to 191 characters at once. Characters may be inserted into the buffer by using *FX138,2,Y where Y is the character to be inserted.

Likewise, incoming characters are initially stored in the RS423 input buffer until the Electron is ready for them. This buffer will hold up to 256 characters. However, as soon as 248 characters are present the RS423 port will instruct the transmitting device to stop sending (by dropping CTS) thus allowing a margin of 8 characters before data begins to be lost. Characters are removed from the buffer by using OSBYTE 145, the received character being returned in Y. For a further description of these calls refer to Appendix B.

2.5 Dealing with problems.

If the RS423 port will not transmit or receive check that the data lead is correctly connected to the modem, printer or other device. If the problem persists check that the cable itself is intact.

If the problem is less severe e.g. characters can be received but they do not correspond to those being transmitted, it is possible that the baud rates and/or data format are incorrectly set. In this case check the *FX7, *FX8 and *FX156 settings respectively (refer to the Electron User Guide for full details).

Chapter 3

Commstar Communications

3.1 Introduction.

Commstar for the Electron is a combined package of Viewdata and ASCII communications software supplied on a 16K Eprom. It is supplied fitted into the RS423 communications cartridge which plugs directly into the Plus 1 interface and it will allow you to link your Electron computer, via a suitable modem, to other computers in order to communicate with them.

Take for example British Telecom's Prestel service. Almost at the press of a button you can have access to a multitude of up-to-the-minute information pages, world news or weather, latest travel bulletins and much more. Access to Micronet 800 with many free programs that can be downloaded in seconds, free advice and news is just one example of how versatile your computer can really be.

Perhaps you might not have heard of 'bulletin boards', be sure that you soon will have! Free access bulletin boards are simply micro-computers whose dedicated task is to answer the telephone, take messages and provide the caller with access to its files or programs, and messages left by other users. If you have a problem, someone out there has a solution, so why not ask them? Simply leave your message on one or more of the many bulletin boards that have now been established and for the cost of a phone call you will soon have an answer.

At a more obvious level, how many times have you wanted to get a copy of a program to a friend or a business colleague, quickly? With Commstar you can transfer a file of ANY type, between two Electron's (or an Electron and another computer) in the space of a phone call.

3.2 Communications software.

A 'terminal program' provides the means by which a micro-computer can act as a terminal to another computer. It provides the software interface that works in conjunction with the communications hardware, to allow meaningful communication to take place. Commstar is a very comprehensive and powerful terminal program which uses the Pace RS423 cartridge to send data to, and receive data from, the equivalent port of the 'host' computer.

Commstar may be used to access a huge variety of different systems ranging from simple bulletin boards to sophisticated public databases such as the American SOURCE system. Basically, what Commstar does is to read and interpret incoming data from the RS423 port, and store it or act upon it as required. When Commstar is transmitting, it reads data from memory, from a file or from the keyboard and passes it to the RS423 in the correct format for sending. Obviously there are many 'houskeeping' functions which must be carried out but Commstar 'hides' all of these from the user making it very simple to use.

3.3 Communications hardware.

Within a computer, information is transferred between different components in 'parallel'. You may often hear the 6502 processor chip which is used in the Electron machine referred to as an '8-bit processor'. This indicates that the internal paths along which data is transferred are 8 bits wide i.e. there are 8 separate 'wires' which carry data in the form of electrical signals around the computer simultaneously. However, when large distances are involved this method becomes unsatisfactory. The individual bits of data tend to travel at different speeds within the wires and introduce what is known as 'data skew' i.e. the data becomes garbled. Apart from this it would be rather expensive to lay eight wires across the country instead of one!

In order to overcome these problems it is necessary to serialise the data and transmit it a single bit at a time through a two or three wire transmission circuit. This is the function of the RS423 serial port provided with Commstar.

The RS423 interface converts data from your computer into serial form which makes it suitable for transmission over longer distances than would be possible with a parallel port. Data skew in parallel lines is the main reason that data cables used on disc drives and parallel printers are rarely longer than about a metre and a half.

The RS423 port of your computer, when used in conjunction with a length of suitable cabling, can be used to transfer data to and from another computer. Communication is only meaningful however, if the parties involved understand each other. In this respect, some form of 'protocol' is required to ensure that each computer knows how to interpret the signals it receives from the other. This protocol is the equivalent of word, sentence and

paragraph structure in English i.e. the correct punctuation must be used in order to ensure that the text makes sense to the reader. Commstar, in conjunction with the associated hardware, provides the necessary environment for ordered communication to occur.

3.4 The role of the telephone.

It is both impracticable and expensive to connect two computers together over a long distance with a direct wire connection (commonly referred to as hard-wiring). Apart from the technical problems associated with laying the cable, there is a limit to the distance even a serial signal can travel without being 'boosted'.

The simplest solution (although not necessarily the most effective) is to use a network of cabling which already exists, the Public telephone network. There are however, a number of technical difficulties associated with using telephone lines in this way. These arise from the fact that they were not designed to carry digital signals from computers: they were designed to carry analogue wave forms, in particular, the human voice. Digital signals must be converted into analogue form before they can be passed to the telephone network and this task, called modulation is carried out by a Modem. In fact the modem carries out two jobs: that of converting the outgoing signal into analogue form and the reciprocal task of converting incoming signals into a form which the receiving computer can understand (demodulation). Thus a modem both MOdulates and DEModulates electrical signals. In simple terms, it is the interface which allows you to connect your computer to the telephone system.

It is possible therefore, with a suitable communications port and the appropriate software, together with a modem and a telephone, for two computers to communicate over a very great distance. The Pace communications package provides all you need.

3.5 Why an 'intelligent' program?

Intelligent terminal programs are so described because they offer sophisticated methods of receiving and storing data which has been transmitted by another system. 'Dumb' terminal programs are limited to merely sending whatever you type at the keyboard to the RS423 port and as such are of very limited use.

Commstar is described as intelligent because of the many complex and sophisticated features that it offers in order to ensure correct communication with the remote system. This manual describes each of these features in detail and illustrates how Commstar may be used to gain access to Prestel or the many bulletin boards and other forms of computer telecommunications that are now emerging.

There are essentially two different operating modes within Commstar, Prestel and Terminal emulation. This duality arises simply because Prestel and other viewdata systems use their own set of communications protocols which are different from those used by more generalised systems. In simple terms Prestel 'speaks' a different language to bulletin boards, Telecom Gold etc.

This manual has been written to reflect the differences in operation between the sections and, after detailing the installation procedure for Commstar, describes the Terminal and Prestel emulation facilities separately.

3.6 Accessing Commstar.

Once the RS423 cartridge with Commstar has been fitted to your Electron computer it may be accessed at any time by typing :

*COMMSTAR<Return>

or simply

C<Return>

This will select the Commstar ROM and display the Terminal Mode menu of options and commands. Alternatively, if you wish to use a Viewdata host such as Prestel you can access the Viewdata menu directly by typing :

*COMMP

in this case you should now refer to Chapter 6 on how to proceed.

In terminal mode the first thing that you should notice is that Commstar identifies that it is set up as an ASCII terminal (as opposed to a Viewdata terminal) with the following heading :

Emulate : Terminal

In this mode Commstar will behave as an intelligent terminal and will handle incoming and outgoing data in standard ASCII format.

The remainder of the display is divided into two areas. The central area of the screen serves as the main command menu and you will see that it is further divided into three sub-menus of related functions.

The first of these sub-menus groups together all commands which operate on Commstar's communications

'buffer' (the buffer and its function are described later). The second sub-menu lists various terminal features which can be switched ON or OFF. These are referred to as 'toggles' i.e. pressing the appropriate key once switches them out of their default settings, pressing it again returns them to their default setting.

The third sub-menu includes those commands which have a more 'drastic' effect on the way that Commstar is configured e.g. whether it is expecting to communicate with Prestel or to act as a terminal, whether it is being used interactively or in File transfer mode, and so on.

Finally, at the bottom of the screen you will notice the status area which is reserved for information relating to the precise way in which Commstar is currently configured i.e. the current settings of the various toggles. If at any time during a Commstar session, you lose track of which options are set, return to the menu using the <ESCAPE> key and refer to this area of the screen.

If you press the # key from the Terminal mode menu the display will flicker as Commstar switches into Prestel mode. The Prestel menu appears very much the same except that it now says Emulate : Prestel at the top of the screen. Pressing # again will switch you back into Terminal mode once more.

All of the features which appear on the menus are described in the following chapters and if you are unfamiliar with communications you may find it useful to read through the main sections before you try to log on to a remote system. Alternatively, Chapter 7 provides a quick start guide for more experienced users.

If you wish to exit Commstar now, you may use either CTRL-BREAK or *BASIC<Return>.

Chapter 4

Terminal Mode.

4.1 Overview

This chapter describes in detail each of the commands and options which are available from the Commstar main menu when operating in 'Terminal' mode.

A discussion of <C>hat mode is followed by descriptions 'buffering' and 'spooling' and details of those commands which operate on the buffer. Examples are provided where appropriate so that operations such as transmitting or receiving files can be easily and quickly mastered.

Other configuration commands are described individually but with reference to related functions.

4.2 <C> Chat Mode

<C>hat mode is so-called because it provides a means of allowing interactive conversation between two users. Both must select <C>hat mode (or the equivalent on a non-Commstar system) and both must have their serial ports initialised in the same way (see section 4.5.2). They must also ensure that their modems are correctly configured for full duplex operation at the appropriate baud rate, one in Originate and one in Answer mode. Although this sounds complicated it soon becomes a matter of habit so don't worry if you are a bit confused at the moment.

Pressing <C> from the main menu will cause the screen to clear except for the elapsed time clock in the top right hand corner (when operating in mode 3, 4 or 6) and the 'Commstar ready' message in the top left. This indicates that Commstar is now ready to accept input from the keyboard to be transmitted via the RS423, or to receive input from the RS423 which will then be displayed on the screen.

Now press <ESCAPE> and you will be returned to the main menu. The <ESCAPE> key should always be used to return to the menu from <C>hat mode.

Perhaps the easiest way to get used to using <C>hat mode is to log on to one of the numerous bulletin boards that exist throughout the country.

Enter <C>hat mode by pressing <C> and try dialling one of the numbers now. As soon as you hear the carrier signal (a high pitched whistle), connect your modem, wait for the Carrier detect or equivalent indicator to light, and replace the telephone handset. Assuming that you are still in <C>hat mode you should notice the welcome message for the particular bulletin board which you dialled appear on the screen. If nothing happens

there are a number of items which could be causing a problem :

1. Is your modem correctly set up?

2. Is the modem correctly connected to the Electron (check the lead).

3. Is Commstar correctly configured? i.e. Terminal mode with Chat selected.

Details of the appropriate connections and set-up procedure for the modem which you are using should be provided by the manufacturer of the device. The signals provided at the RS423 are described in Appendix C of this user guide.

If at this point, characters appear on the screen which do not make sense, the likely reason for this is that your RS423 port is configured differently from that of the host. This is determined by the option selected at the <I>nitialise menu. Commstar's default <I>nitialise setting in Terminal mode has been chosen to correspond to the formats commonly used by the bulletin boards in this country. So, if you do experience this type of problem try dialling a different board.

Note that some bulletin boards operate on what is known as a 'call-back' or 'ring-back' system. To use them simply dial the number and let it ring twice, replace the telephone handset and then proceed to dial the number again. This time you will hear the carrier signal as usual.

Once you have successfully received the 'logon' message from the bulletin board you may reply to the prompts by typing on your keyboard. You will usually be asked to enter your name and where you are calling from. Following this, any system messages, such as information relating to new

operating procedures, may be displayed. Finally the main command menu for the bulletin board will be listed and you may proceed to use the board to leave messages, read messages or whatever.

To logoff the board simply select the appropriate option from the command menu and disconnect your modem. Pressing <ESCAPE> will return you to the command menu.

Remember that the <ESCAPE> key may be used at any time during a <C>hat mode session to return to the menu, perhaps to check the status of a toggle or perform a MOS command. Incoming conversational data will not normally be affected, simply return to <C>hat mode again by pressing <C>. However, if the buffer should become full whilst still at the menu, data will be lost. On return to <C>hat mode any data in the input buffer will be displayed but in order not to lose data, it is sensible to exit to the menu only at times when the host system is NOT sending continuous streams of important information e.g. when it is waiting for a response.

4.3 <D> Disc/Buffer

The term 'buffer' is frequently used in the world of computing. A buffer is really very simple in concept; it is a temporary storage area in which data may be held before or after being processed.

Buffers are required in order to reduce the overheads involved in transferring data from the computer itself (which is very fast), to an external device such as a disc drive or printer (which is relatively slow). For this reason, computers are generally geared up to moving data around in 'blocks' in order to overcome the inefficiencies that would be incurred by transferring a single byte at a time. A prime example of this can be seen during transfers to and from floppy disc. When you write a Basic program that reads a single byte from a newly 'opened' disc (or tape) file, what actually happens is that a complete block of data, perhaps 128 bytes in length, is read into a memory buffer from which the particular byte you require can then be extracted. Similarly, when writing to a disc file, data is first placed in a buffer and only when that buffer is full, or the file is 'closed', is it copied to the disc.

When Commstar is being used to transmit or receive data there are two methods of handling data. The first is to use the whole of the available memory on the Electron as a large buffer. In this case incoming data is simply stored in the buffer until the transmission is complete, the buffer contents can then be saved if necessary. If Commstar is acting as the sender, the data to be transmitted must first be loaded into the buffer from disc or tape. An obvious disadvantage of this method is that the maximum amount of data that can be transferred is limited by the amount of memory available for use as the buffer.

If you have a Plus 3 or other disc interface and drive fitted to your Electron, the alternative to buffering is to place the data on disc as it is received, thus the maximum amount of data that can be transferred by this method is limited only by the disc capacity. Similarly, when transmitting using this technique, the data is obtained from disc as and when required. This method is termed 'spooling'. One disadvantage is that if data is being received or transmitted at very high speed, the rate at which data can be obtained from or stored to the disc becomes the limiting factor and slows the transmission down.

When using the ADFS with 3.5" drives, you may find that some incoming characters are lost. This is because the Operating system cannot act quickly enough to display and spool simultaneously.

You may choose to select either buffering or spooling as the means of handling data by use of the <D> option, the default being to buffer the data in memory. This is indicated on the screen by the line :

<D> Disc / Buffer

with 'buffer' highlighted in inverse video.

Pressing <D> will cause Commstar to carry out three actions. Firstly it checks to see whether the current filing system is Disc or Tape. If discs are not in use the screen is cleared and the error message :

! Disc/Net filing not active !
Press any key..

is displayed and the switch does not take place. This is because it is not possible to spool directly to tape. Secondly, if the buffer is ON,

it is switched OFF, otherwise Commstar would not know whether it was activated for input or output or both!

Finally, if the switch to spooling is successful this is indicated on the screen by switching the highlighting from 'Buffer' to 'Disc'.

If the <D>isc option is toggled back to buffer whilst the <B>uffer option is ON i.e a file is OPEN, then the file will be CLOSED.

Normally the buffer is simply the whole of free memory available on the Electron and this varies depending on the screen mode from which you are operating. It extends from the OS 'high water mark' (PAGE when operating from BASIC), to HIMEM for the display mode selected, and it's capacity is therefore approximately 17K in Mode 6 but this may vary according to the filing system in use.

For the majority of applications the 17k offered by Mode 6 is quite sufficient as far as program transfer is concerned. In order to allow the transfer of data files which may be larger than 17k, the <D>isc option may be selected. This option allows files to be spooled to and from disc, thus any attempt to transfer data will request a filename to be used for the storage of data received or as the source for data to be sent.

Unfortunately as it is not possible to spool directly to tape, data must be buffered in memory before being saved and transfers are therefore limited to the memory available.

Notice that the word 'data' is used generally to include any type of information which is to be transmitted, whether it be a BASIC program or a binary data file.

Commstar allows seven separate operations on the buffer, each of which has an entry at the command menu. These, in conjunction with the ability to switch it 'on' or 'off' (see section 4.4.1) make it extremely flexible. Obviously, not all of these commands apply when disc spooling is active and differences in operation are pointed out in the discussion of each individual command given below.

4.4 Buffer Commands

4.4.1 <B> Copy to Buffer

When operating from <C>hat mode, incoming data from the remote system is not normally stored, i.e. once displayed, the data is lost i.e. the default condition for <C>opy to buffer is OFF. The <B> option on the menu allows you to override the default and switch the memory buffer ON, or if spooling is in use, store the incoming data in a disc file.

Try pressing <B> from the menu now (check that the <D> option is set to Buffer) first. You will see that the Buffer entry in the status panel changes to reflect the new buffer status :

Buffer ON

with the ON in inverse. Pressing <B> again switches the buffer OFF once more.

When the memory buffer is ON, all input to the RS423 will be copied into the buffer starting from low memory (PAGE) and working toward HIMEM.

In the event of received data exceeding the buffer capacity, Commstar will automatically send a signal (XOFF, see section 4.5.5) to the host computer in an attempt to suspend transmission; at the same time it will switch the buffer OFF (accompanied by a 'beep') and print a 'Buffer Full!' warning message on the screen.

If the host system acts on the XOFF you may proceed to <S>ave the buffer to disc or tape (refer to section 4.4.5) should you wish to do so. To continue receiving data the buffer must be <W>iped and the buffer switched ON again before returning to <C>hat mode. At this point the host system, if it responded to the XOFF, will still be waiting for

an XON signal. This is issued by typing <CTRL-Q> from <C>hat mode and will re-activate transmission from the host.

Notice that pressing <B> whilst disc spooling is active, will clear the screen and request a filename :

Filename ?

Entering a valid filename will cause Commstar to open a disc file into which incoming data will be spooled. Once the file has been OPENed you will be returned to the menu. It is very important when using spooling in this way that the active file is properly CLOSEd before you exit Commstar or dial another system. For this reason, Commstar will automatically CLOSE the file when <ESCAPE> is pressed to return to the command menu. Similarly if <B> is pressed while Spooling AND buffering are already ON, the effect will be to switch OFF buffering by CLOSEing the disc file.

The buffer may also be switched ON or OFF from within <C>hat mode by pressing function key <f1>. A message indicating the new status of the <B> option will be displayed. If disc spooling is in use, pressing <f1> will CLOSE the file and no further data will be saved.

4.4.2 <L> Load Buffer

This option allows the user to load a file from the current filing system into the buffer in order that it may be transmitted via the RS423 port to the host system.

On selecting this option you will be presented with the prompt :

Filename ?

This may be any valid filename for the filing system which is currently in use, tape or disc for example. Refer to the appropriate filing system guide to determine what constitutes a valid filename.

It is important to note that the <L>oad buffer option will automatically delete the previous buffer contents as if the <W>ipe option had been used. It is up to you to ensure that any important data residing in the buffer has been <S>aved prior to using this option.

This option may still be used even when <D>isc spooling has been selected as spooling does not affect the memory buffer at all.

4.4.3 <O> Output buffer

Selection of this option will output the current contents of the memory buffer, or a file if <D>isc spooling is in operation, to the RS423 port. When using spooling you will be asked for a filename :

Filename ?

You should then enter the filename of the file to be transmitted, ensuring that the usual filing system naming conventions are obeyed.

Following the filename, or immediately if you are using the memory buffer, you will be asked :

Delay (0-9) ?

The speed at which the data is sent to the RS423 may be varied by selecting a rate between 0 and 9, 0 being the fastest speed. This does not affect the baud rate for transmission i.e. data leaving the RS423 does so at the selected baud rate. The necessity for this option arises in cases where the host system is incapable of receiving information in a continuous stream at the operating baud rate. A suitable setting for bulletin boards such as Forum 80 would be 3 or 4.

Having selected a speed you will be further prompted with :

Use codes ?

This refers to a system of buffer control codes which are recognised by a number of bulletin board systems e.g. Forum 80. Thus, answering 'Y' to this option will allow Commstar to automatically open the buffer in the remote terminal and close it again when the transfer is complete. These codes should be used whenever possible to reduce the risk of spurious characters (caused by

'noise' in the line or equipment) from entering the buffer before or after file transfer.

You can abandon <O>utput at any time by pressing <ESCAPE>.

4.4.4 <R> Reset buffer

This option applies only when memory buffering is being used. It allows Commstar's internal buffer pointers to be reset to the beginning of the buffer without corrupting the data in the buffer. It is useful when either the <V>iewing or <O>utput options are interrupted by use of the <ESCAPE> key. Normally <V>iewing or <O>utputting would be resumed from the point of interruption. The <R>eset command overrides this default and allows these and other commands to operate from the start of the buffer.

4.4.5 <S> Save buffer

When using the memory buffer, it may be necessary, following a file transfer or a <C>hat mode session with the buffer switched ON, to save the contents of the buffer to a file. The <S>ave option allows the saving of received data to a file on the current filing system. You will be prompted for a filename :

```
Filename ?
```

to which you should reply with the name of the file that you wish the data to be saved into.

In the case of program transfers, the appropriate catalogue information will not be present although the file contents and length will be correct. When using discs it is a simple matter to re-LOAD or *LOAD the program file to the appropriate position in memory and then SAVE or *SAVE to disc once more to create the correct catalogue information.

Cassette users will be required to *LOAD the saved file to the correct address and 'CALL' its execution address. It may then be re-saved using the MOS *SAVE command.

This option is not applicable when spooling is in use.

4.4.6 <V> View buffer

When memory buffering is in use, the current buffer contents may be listed to the screen for <V>iewing purposes by using this option. Two further choices are offered :

Delay (0-9) ?

This operates in a similar manner to that described under <O>utput but it's function is simply to allow detailed inspection of the buffer contents if required. A further option :

Hardcopy ?

will allow a hardcopy of the buffer to be obtained on a suitable printer.

The listing of the buffer may be temporarily halted at any time by pressing the <SPACE> bar. To continue listing press any other key except <BREAK> or <ESCAPE>.

Warning - The <V>iew command should only be used when the buffer contents are known to be ASCII. Non-ASCII files i.e. tokenised BASIC or machine code may contain control codes which will be interpreted by the Operating System as VDU driver codes resulting in erratic and sometimes 'fatal' results.

4.4.7 <W> Wipe buffer

This command empties the buffer clear of ANY data that it contains. Always use this command with care! It is generally only used before receiving program or data files in order to ensure that no unwanted characters are present.

When this command is issued, confirmation is requested :

<W>ipe, are you sure (Y/N) !?

Replying 'Y' will execute the command, any other key will cancel it. Note that there is no way of recovering the buffer contents once they have been <W>iped.

For the same reasons as discussed under <L>oad buffer this command may still be used when <D>isc spooling is operative.

4.5 Terminal Configuration Commands

4.5.1 Overview

Although the use of an RS423 or compatible port ensures a high degree of compatibility between different computers from the hardware point of view, there are still a number of factors which must be initialised correctly by the user before communication can take place.

The most obvious of these is the speed at which data is transmitted. This rate, commonly known as the baud rate may vary from 75 baud up to a maximum (theoretical) of approximately 19000 baud, 300 and 1200 being the commonest in use with micro-computers.

A second important factor is the format of the data which is transmitted. How long is each word? (Note that a word in communications equates to a character or byte in normal computing terminology). Is parity used and if so, is it even or odd ?, How many stop bits are used ?

The commands and options described below provide great flexibility in the way that Commstar can be configured, giving it the power to be used with a huge variety of remote systems.

4.5.2 <I> Initialise RS423

This is one of the most important options on the Commstar configuration menu having being designed to allow simple initialisation of the RS423 interface.

The options offered in the initialisation table govern the precise way in which the RS423 converts the parallel data it receives into serial form for transmission, and conversely, how it interprets incoming data.

The table will appear as follows :

	Word	Parity	Stop	
0	7	Even	2	
1	7	Odd	2	
2	7	Even	1	
3	7	Odd	1	
4	8	None	2	
5	8	None	1	<
6	8	Even	1	
7	8	Odd	1	

<R>eceive 300 <S>end 300

Select ?

The currently selected option from the table is indicated by the left arrow and a new option may be selected by typing the appropriate number.

The most commonly used formats are :-

FORUM 80, Telecom Gold etc. - 7 bit word,
Even parity,
1 stop bit

TBBS & CBBS type bulletin boards - 8 bits,
No parity,

Using an 8 bit word, no parity and 1 stop bit you will still be able to access FORUM 80 as the eighth bit is ignored in ASCII codes. This setting, option 5 in the table, is therefore used by Commstar as the default.

The <R>eceive/<S>end line below the table indicates the currently selected baud rate for the reception and transmission of data respectively. If instead of selecting one of the menu options, the 'R' or 'S' keys are pressed, the appropriate baud rate will cycle through the list of possible values, one step for each key press. Using this method it becomes a simple matter to select the required baud rates. The default baud rate is 300 for both send and receive when operating in Terminal mode.

When the appropriate data format and baud rates have been selected press <Return> to go back to the main menu.

4.5.3 <A> Auto-linefeed

Some remote systems require that a Carriage Return character is followed by a vertical line feed (ASCII &10), whereas other may provide their own.

The <A>uto-linefeed option on the Commstar menu operates as follows :

If <A>uto-linefeed is ON, a vertical Line Feed character is inserted into the output stream following every Carriage Return. This applies both when the buffer is being <O>utput and when it is being <V>iewed. If the remote system automatically generates a Line feed each time it receives a Carriage Return this option may be left OFF.

Similarly, if Carriage Return characters are detected in the incoming data stream in <C>hat mode and <A>uto line feed is ON, a vertical line feed will be inserted as the data is displayed.

The default condition is Auto-linefeed ON and the current status of the option is displayed at the bottom of the menu screen. If you find that a blank line occurs between lines of text on your screen you should switch Auto-linefeed OFF.

Auto-linefeed ON/OFF may be toggled from <C>hat mode by pressing function key <f2>.

4.5.4 <E> Echo ON/OFF

Most bulletin boards and mini/mainframe host systems provide an 'echo' of the characters that you are sending. Thus what you view on your screen is actually the echo from the remote computer.

When transmitting to systems that do not supply an echo it is necessary to provide your own so that you can see what is happening. This is termed 'local echo' and can be switched ON from the menu by selecting the <E>cho option.

Note that switching this option ON does not cause Commstar to send an echo of the characters received from the host back to the host.

Echo ON/OFF may be toggled from <C>hat mode by pressing function key <f0> and the current status is displayed at the bottom of the screen when working from the menu.

4.5.5 <X> XON/XOFF

In order to ensure that data is transferred correctly between two computers, a number of protocols, both simple and complex, have been developed. One of these involves the use of XON/XOFF flow control. The <X> option on the main menu will allow you to transfer files using full XON/XOFF flow control protocols.

When a host computer which utilises XON/XOFF protocols, wishes to access one of it's discs or perform some other background task, it will interrupt Commstar's <O>utput buffer function by transmitting an XOFF signal (CTRL-S). On receiving this signal during transmission Commstar will enter a 'wait' state until an XON signal is received at which point it will resume transmission. This technique ensures that data is not lost during the transmission.

As each XOFF signal is received you will notice a '*' appear in the top left hand corner of the screen and the listing will pause. When the next XON is received the '*' will be replaced by a space and the listing will continue. The Electron keyboard is strobed at all times during buffer <O>utput and even while Commstar is in a wait state you may exit this option by pressing the <ESCAPE> key. This feature is particularly useful if the system 'hangs' because no XON signal is received from the host following an XOFF.

Switching XON/XOFF ON will cause Commstar to acknowledge the protocol described above, switching it OFF will cause it to ignore any XON or XOFF signals received.

4.5.6 <@> Filter ON/OFF

The ASCII character set requires only 7 bits in order to represent the 128 characters available. Since data is transferred within the computer 8 bits at a time, the eighth bit is usually set to '0'. This is also true of the vast majority of incoming data. However, it is quite possible that noise occurring on the line during data transfers could cause the eighth bit to be set to a '1' in which case it could be interpreted as a control code and acted upon accordingly.

In order to avoid this situation all incoming data is normally masked (logically ANDed) with &7F in order to ensure that the eighth bit is '0'. Masking in this way will ensure that the 8th bit is set to 0 but it will not detect corruption in the data. The process is termed 'filtering' and the default condition is Filter ON.

If control codes are being deliberately sent and you wish the Electron to act upon them, the filter may be switched OFF by pressing the <@> key once. This may be useful when accessing some of the coloured bulletin board systems which are now active. Pressing it again will restore the default condition.

4.5.7 <M> Mode

The screen display format used in Terminal <C>hat mode can be changed to any of the Electron's available modes so that a variety of display formats are available. The currently selected mode number is displayed at the menu so that you can see at a glance which mode you will be using on entering <C>hat mode.

Note that when memory buffering is in use, the amount of memory available for the buffer will vary depending on the amount of memory required for the screen display. Thus, if an attempt is made to switch from mode 6 to mode 0 whilst Commstar's internal pointer to the top of the buffer exceeds HIMEM for that mode, Commstar will sound the internal bell to warn you that there is insufficient memory and the switch will NOT take place. This prevents data in the top of the buffer from being overwritten by the screen display. You may of course <S>ave or <W>ipe the buffer and then proceed to change mode.

Changing between modes can also be effected from <C>hat mode by pressing function key <f5>.

4.5.8 <P> Printer ON/OFF

Using the <P>rinter option from the menu or by pressing <f3> from <C>hat mode, input from the RS423 may be copied to a printer. Note that this applies only to input received in <C>hat mode.

When the printer is active, XON/XOFF protocols are used in order to avoid the situation where the computer 'hangs' because it's input buffer is full. The problem is particularly acute when either the printer is very slow or the transmission rate is high i.e. the printer buffer fills and in turn causes 'jamming' at the RS423. If the printer is sufficiently fast (or when a printer buffer is in use) the problem will not arise.

The use of XON/XOFF is essential and is independent of the XON/XOFF menu option. In order to receive data reliably whilst printing, the host system must be capable of supporting XON/XOFF.

The default condition is Printer OFF.

4.6 Miscellaneous Features

4.6.1 The Elapsed Time Clock

Commstar maintains it's own internal clock which displays the elapsed time in minutes and seconds since it was last reset. This display is present in modes 3, 4 and 6 (i.e. 40 or 80 column text only modes) and is shown both at the menu and in <C>hat mode.

There are three conditions under which re-setting may occur :

1. When Commstar is first selected
2. The <BREAK> key is pressed
3. <f8> is pressed from <C>hat mode.

The clock display is updated every second and remains unaffected by other operations until it is reset by one of the means listed above.

After reaching 59:59 the clock 'wraps around' to 00:00, this should be taken as warning that your next phone bill will be astronomical!!

If you wish to switch off the clock display you may do so by pressing <f4>, this does not reset the clock.

4.6.2 Transmit 'ESCAPE' character

When operating in <C>hat mode the <ESCAPE> key is used to return to menu level. It may sometimes be necessary to send an <ESCAPE> character (ASCII 27) to the host system. Since this cannot be achieved via the <ESCAPE> key, <f7> is programmed to generate ASCII 27 and send it to the RS423 port.

4.6.3 Transmit 'Break' level

Many intelligent terminals are equipped with a special key labelled 'Break'. This is NOT the same as the <BREAK> key on the Electron micro-computer. It's function is to transmit a 'Break' level or 0 volts on the data line in order to 'wake-up' the host computer and initiate the Logon procedure. In order to maintain compatibility with such systems, function key <f6> will generate a Break level from within <C>hat mode.

4.6.4 The 'DEL' character (ASCII 127)

It has been found that some remote systems use DEL characters to 'pad out' messages to some terminals. The reason for this is largely historical in that when a computer is communicating with a mechanical teletype (as opposed to a VDU), it has to allow time at the end of each line for the print head to return to the beginning of the next line. It is common practice to do this by inseting a stream of DEL characters after each Carriage Return. A mechanical teletype will simply ignore (since it is incapable of deleting) these but on a normal VDU the result is that the cursor backspaces to a point on the previous line. In order to avoid this problem you may configure Commstar to ignore incoming DEL characters by typing *FX251,1 from the command menu. The default condition is to act upon DEL characters normally and this can be reinstated by entering *FX251,0 if you have previously executed *FX251,1.

CHAPTER 5

<F> File Transfer

5.1 An overview of XMODEM

This section of Commstar provides full Xmodem file transfer capabilities, to and from a host system with Xmodem capability, using Ward Christiensen type protocols and handshaking.

Files which are sent or received under Xmodem are broken down into sequentially numbered 128 byte blocks of data for transmission purposes, although this action is totally transparent to the user.

An 8-bit CRC checksum is calculated for each block prior to transmission and this is sent with the data. The checksum is re-calculated at the receiving Xmodem terminal and compared with the original CRC. If these are different then it is assumed that corruption of the data has occurred and re-transmission of the appropriate block is requested.

The generation of checksums and block numbers, and the requests for re-transmission of corrupted blocks, is carried out entirely automatically and need not concern the user.

All errors encountered are re-tried 10 times before the user is given the option of <Q>uitting or <R>etrying. When the option to <R>etry is selected the transmission will be resumed starting with the block following the last block to be successfully transferred.

This system virtually assures perfect data transfer even under extreme conditions such as temporary loss of carrier signal or excessive line noise. Note that the <F> option can only be used in conjunction with another terminal that is capable

of handling the XMODEM protocols e.g. another Commstar or a CP/M based package such as Modem-7.

Under XMODEM, data is transferred in the following format :

<SOH> - Start Of Header, decimal 01 to start each block

Block Number - one binary byte

255-Block no - (block number EOR 255)

128 data bytes

Data checksum - 1 byte, carry discarded

It is not within the scope of this manual to fully cover the operation of XMODEM type file transfer and the user is given the above information purely to aid understanding of the process and the error messages that may be generated by Commstar whilst in this mode. The procedures for using the <F> option are detailed below.

5.2 Sending Files

This section describes the correct procedure for using the <F> option to transmit files.

Firstly, check that the RS423 port is suitably initialised. When transferring to another Commstar machine the default settings are perfectly adequate. If however, the remote system is not Commstar based but uses another proprietory Xmodem package, an alternative setting may be appropriate. This option may only be selected from options 4, 5, 6 or 7 in the initialise menu i.e. those options using an 8 bit word. Xmodem requires an 8 bit word and will not operate with options 0 - 3.

Now, selecting <F> from the main menu will display the prompt :

<S>end or <R>eceive file ?

Simply press S or R to select the appropriate option, <S> in this case.

Remember that when using the memory buffer, as opposed to spooling a file to or from disc, you must first <L>oad the buffer with the file that you wish to transmit.

When spooling is in use you will be prompted for the appropriate filename :

Filename ?

Data to be transferred will then be loaded a block at a time from the file specified. When the transmission is complete the file will be closed.

The sequence of operations that actually occurs during the <S>ending of a file is described below :

Having selected <S>end mode whilst using the

memory buffer, the buffer contents will be padded out with spaces so that its length is a multiple of 128 bytes. If spooling is in use, the last block read from the active file will be padded out in the same manner.

The message :

Awaiting Initial <NAK>

will then be displayed and on receiving the correct code from the remote XMODEM system, Commstar will proceed to transmit a block. This is indicated by the message :

Block n

where n is the sequence number of the block currently being transmitted. Data is sent without echo to the screen and if transfer is successful the next block will be sent.

If errors are detected by the receiving system a request for re-transmission of the block in question will be sent i.e. the sender will generate a 'No Acknowledge' signal for the block. This is indicated on the sender's screen by the message:

NAK

The block will then be re-transmitted.

Successful completion of the transfer will be indicated by the message :

Transferred
Press any key

Pressing a key at this point will automatically cause Commstar to return to the menu.

5.3 <R>eceiving files.

The sequence of events for receiving a file is very similar to that for sending. Having selected the <F> option you will be asked if you wish to send or receive, pressing the <R> key will select receive mode. If spooling is in use you will be asked for the filename of the file into which the received data will be stored, alternatively the memory buffer will be used to store the received data.

Once the destination for the data has been established, the number of the next block expected (nn) is displayed :

Awaiting nn

As each block is received the message :

Block nn

is displayed. If any errors are encountered Commstar will inform the host computer by sending a 'No Acknowledge' signal (NAK) and display the error numbers of the errors that were logged. It will then wait for the block to be re-transmitted.

Successful completion of the transfer is acknowledged in the same manner as for <S>end above, pressing a key other than <BREAK> will return you to the menu from which you may proceed to <S>ave the file from the buffer onto disc or tape. If spooling is in use the destination file on disc will be automatically closed.

5.4 File transfer at 1200 baud

It is possible to transfer files between two Commstar systems, using the <F> option, at 1200 baud providing that the modem being used is capable of operating at 1200/75 baud rates.

The procedure is as follows :

1. Choose the <I>nitialise option and set the <S>end and <R>eceive baud rates appropriately (sender at TX1200/RX75 and the receiver at RX1200/TX75).

2. Configure the modem appropriately.

3. <L>oad the buffer with the file to send if you are acting as the sender and buffering is in use.

4. Select <F> followed by the appropriate options to transfer the file.

This is directly equivalent to the procedure described in sections 5.2 and 5.3, the only difference being the initialisation.

5.5 File transfer - additional notes

5.5.1 'Timeout' message

During both <S>end and <R>eceive modes you may see the message :

    Timeout

followed by a number. This is to let you know that the initial 'wait' period for the first block has been exceeded and the next wait period is being entered.

If 10 successive timeouts occur, Commstar will warn you with :

Multiple errors
<Q>uit or <R>etry ?

Simply press Q or R appropriately after checking that there is no obvious reason for the failure.

5.5.2 Error codes

During file transfer the error numbers of any errors which occur in a block, will be displayed. A list of the numbers used and their meanings is given below :

Error number	Description
1	Bad block header
2	Bad block number
3	Bad check number
4	Bad checksum
5	Lost data
6	RS423 error

In the vast majority of cases, errors which occur during data transfer are caused by 'noisy' telephone lines just as telephone conversations are difficult to conduct on a 'bad' line. There are however a number of faults which can occur at the RS423 port itself. If an error occurs which indicates that the RS423 is indeed malfunctioning, first check the serial lead for poor connections. If the lead proves to be in good condition it may be necessary have your machine inspected by a qualified dealer.

5.5.3 Direct connect transfers

It is possible to transfer files between two Electron computers or between a Electron and another computer with a direct wire connection i.e. without using a modem.

When two Electron computers are being used you will require a 'back-to-back' lead with a 5-pin domino connector at each end. However, in order to function correctly CTS and RTS must be shorted together at one end of the lead. Note also that the Data-out from one machine must connect to Data-in on the other and vice-versa.

A lead constructed in this manner should be no longer than about 20 metres.

CHAPTER 6

Prestel Mode.

6.1 Overview

Using Commstar to emulate a Prestel terminal is essentially a completely separate function to Commstar's general Terminal emulation. Prestel uses it's own character set and communications protocols and this results in a number of significant differences which should be understood in order to master the use of Commstar with Prestel.

The most obvious difference is the fact that Prestel utilises the Teletext graphics and character set which cannot normally be displayed on the Electron. This problem is overcome by dynamic redefinition of the character set and use of an adapted Mode 1 screen display.

Prestel uses full colour text and graphic display screens with special features such as double height characters, hidden text fields and flashing text or graphics. Unfortunately due to the limitations imposed by the Electron hardware it is not possible to implement a colour Prestel display of readable quality. However, most of the other features including separated and contiguous graphics, double height characters, flashing text and graphics etc are supported in monochrome giving an extremely good representation of most Prestel frames.

More importantly from the communications point of view is the use of unusual protocols and transmission rates. Prestel operates at 1200/75 baud i.e. it transmits data to the user at 1200 baud and receives responses at 75 baud. The reason behind the use of different baud rates for send and receive is the fact that the public telephone network provides insufficient bandwidth to allow

1200/1200 baud full duplex transmission without using more complex and expensive modulation techniques. Since full duplex functioning is essential to the correct and efficient operation of the Prestel protocols, a narrow bandwidth 'return' channel is provided for user responses, whilst the bulk of the data i.e. the Prestel 'screens', are transmitted at 1200 baud giving reasonable speed.

The overall result of these differences is that many of the normal Commstar menu options are redundant when operating in Prestel mode and are in fact 'locked' out. The options which remain useful and differences in the way in which they operate in Prestel mode, are described in the following sections. These include :

<#> Comms/Prestel	<D> Disc/Buffer
<C> Chat	<W> Wipe buffer
<I> Initialise	<S> Save buffer
<@> Filter ON/OFF	<O> Output buffer

and

<*> (for MOS command)

The screen mode is automatically switched and locked into Mode 1 and all toggles are switched to their Prestel mode default condition i.e. all OFF. The buffer may not be switched ON because the format in which the Prestel screens are received does not allow the pages to be reproduced correctly if the buffer is <V>iewed. An alternative method of 're-tracing your steps' is allowed with the <COPY> page and 'tag' & 'retrieve' page options which are described in detail later.

The memory buffer may be used normally for the purpose of downloading telesoftware. Similarly spooling may be switched ON so that downloaded files which are larger than the memory buffer may

be transferred directly to disc. It is also possible to download straight to Tape in Prestel mode.

The Prestel 'logon' and user procedures are described in the following section. Experienced Prestel users will notice minor differences in the way Commstar operates but you will soon become used to these.

Prestel is of course a subscription service, charges being levied via your normal telephone bill. Many of the actual pages (sometimes called frames) are free, some are charged for. Complete Prestel details, including charge rates, will be provided when you first subscribe.

It is not within the scope of this manual to provide a comprehensive Prestel User Guide, such information can be obtained from The Prestel Directory which is provided on a regular basis to Prestel customers. However, those features which are 'Commstar dependent' will be described in full.

6.2 Logging on to Prestel

If you have entered Commstar using *C* you will first have to press <#> to switch into Prestel mode. Alternatively, Prestel mode can be entered directly from Basic by typing *COMMP. You will notice that the line at the top of the Commstar menu now says :

Emulate : Prestel

At the bottom of the screen the status panel should indicate that all options are set to OFF.

The RS423 interface is automatically configured to receive at 1200 baud and transmit at 75 baud. This can be observed by selecting the <I> option from the main menu. You will also notice that option 2 from the table (7 bit word, even parity and 1 stop bit) is selected. The <I> option is left active in Prestel mode so that users of the 300/300 or 1200/1200 baud service provided by Prestel can configure Commstar appropriately.

Now, returning to the main menu select <C> for chat mode. Initially the screen will be completely blank except for the cursor at the top left. The clock is not displayed in Prestel mode.

Dial the appropriate number for your local Prestel computer and wait for the 'carrier' signal. When this is present activate the 'modem connect' or equivalent switch on your modem. You should then observe the Prestel introductory page being displayed.

In response to the prompt type in your 10 digit Prestel user number using the Electrons's normal numeric keys. For each key pressed a dash (-) will appear on the screen. If an error is made during entry the attempt may be cancelled by pressing the '*' key twice. After your correct user number

has been entered the next Prestel screen will be displayed requesting your 4 digit personal password. Type this in on the keyboard and again a dash will be printed for each key press. Incorrect entries may be cancelled by pressing '*' twice.

Following a successful logon procedure Prestel may be used as it would with any other Prestel adaptor. There are however a number of minor differences which are described below. New users should consult the Prestel directory before reading these notes.

6.3 The Prestel '#' key

Prestel makes extensive use of the # symbol to mean 'proceed to next frame'. Within Commstar the <Return> key is used in place of '#', so where a message such as :

to continue

occurs, simply press the <Return> key instead of <#>.

The reason for this is that some of the character codes used by Prestel differ from those in the ASCII character set. The code used by Prestel for <#> actually corresponds to the underline <_> character in ASCII, a point that is reflected in the fact that pressing underline in place of the <Return> key produces the same results.

6.4 Copy current screen to disc

At any point during a Prestel session the <COPY> key may be used to obtain a disc image of the current Prestel screen. On pressing <COPY> once you will be prompted :

Page filename ?

Entering a valid filename at this point will allow Commstar to save a copy of the current screen in that file on the disc. When the action is complete the original Prestel screen will be restored unless there is insufficient room in the buffer in which it may be placed while the <COPY>ing is being carried out. This however will only occur if you have downloaded a large program and have not transferred it to disc or have simply not emptied the buffer following <S>aving.

Screens saved in this way may be re-loaded using function key f4 (see section 6.5.5).

6.5 The function keys in Prestel Mode

When operating from Prestel chat mode the function keys operate as follows :

6.5.1 <f0> Tag current page

This key provides the facility to 'tag' Prestel pages of particular significance so that you may return to them at a later stage in the Prestel session. To tag a particular page in this way simply press <f0> once. This will store the page number of the currently displayed page, at the top of the Commstar buffer. It will the sound the bell and display a message on the bottom line of the screen :

Tagged

In theory you will be able to tag many pages but in practice a limit of 25 is advisable. Page numbers are stored in the same sequence as they are tagged.

6.5.2 <f1> Retrieve tagged page

When you wish to retrieve pages which have been tagged using <f0>, the <f1> function key may be used. This will retrieve previously tagged page numbers from the buffer which are the passed to Prestel by Commstar so that the corresponding page is re-displayed on your screen. One page number is retrieved for each key press, in the same sequence as they were initially tagged. Pressing <f1> four times in sequence will cause the fourth page tagged to be re-displayed.

When the last page tagged has been retrieved Commstar 'wraps' around to the beginning of the page sequence i.e. the first page tagged.

6.5.3 <f2> Clear page tags

Pressing <f2> when using Prestel will clear any tagged page numbers. These cannot be re-instated so use this key with care!

6.5.4 <f3> Reveal hidden text

There is a facility on Prestel to create 'hidden' text fields which cannot normally be seen. These are useful for such activities as quizzes which may be run from time to time. The answers to questions can simply be hidden on the screen and only revealed by the user should he wish to do so. The <f4> function key is used from Commstar to carry out just this function. Pressing it once will reveal any hidden fields which are present. Note that if there are no hidden fields pressing this key will have no effect.

6.5.5 <f4> Load Frame

Frames which have been stored to disc or tape using the <COPY> key can be re-loaded and displayed by pressing <f4> from Prestel chat mode. You will be prompted for the filename in which the page is stored :

Page filename ?

After entering this the frame will be loaded and displayed correctly. At this point it may be printed if required using function key <f6>.

6.5.6 <f5> Download program

Function key <f5> is used to initiate the program download procedure from Prestel mode. This is the same key that is used by other Micronet software and should only be used when requested i.e. when you are currently located at a Prestel/Micronet 'header frame'. Full downloading instructions are provided on Micronet for newcomers to the system. Briefly the procedure is as follows.

Select the program that you wish to download and step through the introductory pages until you reach the header frame. This frame consists of information relating to the size of the program, and any special download procedures that apply. The page number of this frame will normally be suffixed with a 'c' and is termed a c-frame. It is also usual at this point for a message along the lines :

Press f5 to download

to be displayed. As an alternative you will be offered the choice of returning to the telesoftware menu.

Assuming that you wish to continue with downloading, press <f5>. If buffering is in use you will notice a short delay and the message :

Checking..

and then a number which indicates the number of frames to be received.

At this point one of two possible actions may be taken by Commstar depending on whether or not you have discs fitted.

1) Tape Filing system

If the number of frames comprising the file is

less than 18, the whole file can be contained in the memory buffer and at the end of downloading Commstar will display the message :

Save buffer as "filename", OK (Y/N) ?

where "filename" is the name of the file as given in the header block during downloading. If you press <Y> or <RETURN> this is the name that will be used to save the file under. Alternatively, answering <N> will prompt for a filename of your own choice. In either case you will be asked to press Record and Return on your data recorder. At the end of saving the cassette motor will be stopped and normal operation will be resumed.

If the file is longer than 18 frames it will not fit in memory and will print the following cautionary messages :

Warning - file may exceed buffer size.
Please have Tape/Disc ready
Press any key

This will serve to remind you to have a fresh tape or disc ready onto which the file can be saved as it is received.

Commstar will then proceed to download the file frame by frame until either the download is complete or the buffer becomes full. If the buffer fills first, downloading will be temporarily paused and Commstar will save the current buffer contents in a file named after the filename given in the header block :

Buffer full...saving data
Record then Return

You should now press Play and Record on your data recorder so that saving can commence. When saving of the current buffer is complete Commstar will

stop the cassette motor and continue with the downloading process repeating this stage as often as necessary to save the whole file. Completion of the download is indicated by an audible 'beep' and you will be returned to normal operation.

2) Disc based system

Once again Commstar will read the header frame for the file and determine the number of frames to be downloaded. In this case however, a file with more than 18 frames will simply cause Commstar to select disc spooling automatically and at the start of downloading the message :

Save buffer as "filename", OK (Y/N) ?

will be displayed. Files of less than 18 frames will fit in memory and downloading will take place without access to discs. At the end of the transfer the buffer contents must be explicitly saved using the <S>ave buffer option at the command menu.

When disc spooling is active the size of the file is largely irrelevant as it is limited by the capacity of the disc. However, it is worthwhile ensuring that there is at least 32K remaining on the disc you are using before starting to download.

Additional Notes on Downloading.

As each frame of a file is downloaded it will appear on the screen as a continous stream of characters, some of which you will recognise as words. The actual statements of the program are in coded form so you will not be able to identify these. At the end of a frame the screen will clear and the next frame will start downloading. You will notice the page number at the top of the screen is suffixed with a lower case letter. The header frame of a file is usually a 'c' frame but the letter is incremented through the alphabet

until downloading is complete.

If at any time during downloading, Commstar is unable to open a file with a given name (due to a duplicate filename or lack of disc space for example), it will display the message :

Can't open file

and quit the download.

From time to time you will notice that when downloading is complete and the whole file could be stored in the memory buffer, the message :

Executable file.. <R>un or <S>ave ?

will be displayed at the bottom of the screen. This means that Commstar has identified a special header in the file which indicates that the program has it's own 'Save' routine built-in. This usually applies to programs which consist of two or more separate sections contained in one large block of data. If this is the case, the header or c-frame will often contain a message such as :

Commstar users Goto N for guidance
Call address Page+&02

The normal procedure for files of this type is to save the downloaded program, exit Commstar and then re-load the program at the current value of PAGE i.e.

*LOAD filename 1D00

and then type :

CALL &1D02

whereupon you will be presented with a display which informs you that the separate programs are

being saved to tape or disc.

If you press <S> at the <R>un or <S>ave prompt you will be allowed to save the file in the manner described above. Alternatively, pressing <R> will automate the entire process. Note however that the <R> option will only work with programs that are specifically for the Electron. BBC programs which run on the Electron should always be Saved manually.

When the downloading is complete you will be informed on how to proceed, usually you will return to the telesoftware menu. Since some of the programs are designed to run from tape, it may be necessary to amend them before they can be run from disc. In this respect Micronet usually provide the appropriate instructions in the introductory pages to help you sort things out.

Important note on downloading

There have at certain stages during the development of the Prestel service been a number of changes in the specification for the downloading procedures. Unfortunately some of the software, at the time of writing this manual, still obeys the 'old' rules and as a result, certain software cannot be downloaded by normal means. This applies particularly to some of the Viewfax programs. In order to overcome this it has been necessary to include in Commstar an additional option to use the old protocols. On the rare occasion that this option is required it may be effected by the following command :

```
*FX1,1
```

To turn off the option and return to 'normal' rules simply enter :

```
*FX1,0
```

Either of these commands may be entered in the usual manner from the Commstar Prestel menu. The default condition is that produced by *FX1,0.

6.5.7 <f6> Print frame

The currently displayed frame can be printed complete with graphics on standard Epson or compatible printers by pressing <f6>.

It will take about 30 seconds to print a complete frame so it may be wise to save the frames you require to disc or tape using the COPY key and then print them while you are offline i.e. re-load them using <f4> and then use <f6>.

Note that the Linefeeds option on the printer should be OFF, Commstar provides the necessary Linefeeds.

6.5.8 <f7> Transmit 'Escape' character

Function key <f7> has the same function in Prestel mode as in Terminal mode, i.e. to send an Escape character (ASCII 27) via the RS423 port.

This feature may be used on certain Prestel frames to create teletext graphic effects on the screen.

6.5.9 <f8> Re-display current page.

It is possible when accessing Prestel that some pages will be corrupted during transmission. This is generally due to noise on the telephone line and cannot be prevented. If the line is intermittently noisy, the current page may be re-displayed by pressing the function key <f8>. This action requests the Prestel system to re-transmit the current page which will subsequently be re-created on the Electron screen. It may still of course be corrupted during transmission but more often than not the problem will be alleviated sufficiently to read the page correctly.

If page images are persistently corrupted it may be worthwhile to logoff from Prestel and re-dial on a new line.

6.5.10 <f9> Return to previous page.

Function key <f9> may be used at any time to return to the 'previous' page. In this case previous means the previous page accessed by the user, NOT the previous page in numeric sequence. As an example, if you select one of the options from a Prestel menu and find that it is not the required page you may return to the menu simply by pressing the key <f9>.

6.6 Additional notes

It was noted at the beginning of this chapter that the <I>nitialise and <@> Filter options also remain valid for use in Prestel mode.

<I>nitialise behaves in exactly the same manner as described in Section 4.5.2. It is provided so that users with 300 baud modems only, can configure the baud rates for use with the 300 baud Prestel system that is available on a London number at the time of writing this manual. It is important that you do NOT alter the word format when using Prestel.

Similarly, the <@> option is left in for flexibility. Since Prestel only uses 7 bit words filtering has no effect anyway.

CHAPTER 7

Getting started quickly

The purpose of this chapter is to enable those users who are already well-versed in the field of communications, to get to grips with using Commstar quickly. The procedures used to gain access to bulletin boards and to Prestel are described, very briefly and any additional information required should be obtained from the relevant chapter in this manual. The following notes assume that Commstar has been correctly installed and that you are familiar with the operation of your modem and its connection to the Electron micro-computer.

7.1 Logging on to a bulletin board

The majority of the bulletin boards which operate in this country use 8 bit words, no parity and 1 stop bit at 300/300 baud. These are in fact the default values used by Commstar so you may simply switch Commstar on by typing :

C<RETURN>

This will run Commstar and display the main command menu for Terminal mode. If the board which you intend to access uses a word format other than "8, None, 1" or "7 Even 2", you must adopt the following initialisation procedure :

1. Select <I> from the main menu.

2. Select the appropriate option from the table of possible formats.

3. Set the the send and receive baud rates by pressing either <S> or <R>.

4. Press <Return> to go back to the main menu when you have finished.

Assuming that Commstar is now initialised as required, check that the modem is correctly configured and press <C> for Chat mode. The screen will clear leaving the Commstar ready message at the top of the screen.

Dial the number of the bulletin board and wait for the carrier signal. If the system uses ring-back, let the phone ring once, put the handset down and then re-dial.

When the carrier is present activate the 'modem connect' or equivalent switch on the modem. You should then see the introductory page from the bulletin board being displayed.

From this point you may use the bulletin board normally, commands being entered at the keyboard as usual.

7.2 Logging on to Prestel

You may switch Commstar directly into Prestel mode by typing :

*COMMP<RETURN>

This will run Commstar and display the main menu for the Prestel mode. A line near the top of the screen will indicate this with :

Emulate : Prestel

Commstar automatically initialises the baud rates and word format for use with Prestel, all you need to do now is check you modem configuration, press <C> for Chat mode and dial your local Prestel computer.

When the carrier is present, enter your 10 digit customer identity number using the normal numeric keys. If you make a mistake press the <*> key twice, this will cancel the entry so far and allow you to start from the beginning of the number again. Note that a dash (-) is displayed for each keypress.

Having entered the correct identity number the next page will request your personal password which may be entered in the same manner as the identity number.

Important Note : When accessing Prestel via Commstar, to obtain the Prestel <#> symbol you must use the Electron's <Return> key. For instance, to leave Prestel type :

*90 <Return>

as opposed to : *90#

Remember that the #, or in this case the <Return> is not actually displayed on the screen.

Other Prestel functions such as 'page tagging' may be obtained as follows :

<f0> - pressing <f0> will 'tag' the current page for later retrieval.

<f1> - pressing <f1> will retrieve previously tagged pages in sequence, one page per key press.

<f2> - pressing <f2> will clear all page tags.

<f3> - Reveals hidden text fields.

<f4> - Loads a Prestel frame from a file.

<f5> - initiates the telesoftware download procedure.

<f6> - prints a graphic dump of the currently displayed viewdata frame.

<f8> - pressing <f8> will re-display the current page (useful if it was corrupted)

<f9> - pressing <f9> will return you to the previously accessed page.

In addition the <COPY> key is used to save an image of the currently displayed frame on disc or tape.

CHAPTER 8

Global features

8.1 The <BREAK> key

The effect of the <BREAK> key on the Electron keyboard, when used from within Commstar, is to restore the Commstar main menu and all default settings i.e. the emulation mode will be Terminal, Auto Line feed and Filter will be ON and all other toggles will be OFF. However, any data that was resident in the buffer prior to pressing <BREAK> will remain intact, the buffer pointers are NOT affected.

8.2 MOS commands from Commstar

Most MOS commands can be safely used from within Commstar. From the menu simply type <*> as usual followed by the command that you wish to execute. On pressing <*> the screen will clear and you may type the remainder of the command.

Once the command has been executed the message a further * will be printed as a prompt for other MOS commands. Pressing just <CR> or <Escape> will return you to the command menu.

This option will allow you to inspect a disc catalogue or execute an FX call for example. Care should be taken however not to use MOS or filing system commands that interfere with user Ram space which is occupied by the buffer i.e. *COMPACT, *BACKUP etc. especially if it contains important data. It is also important that commands which list files to the screen should be carried out only on ASCII files for the same reason as discussed under the <V>iew buffer command.

When using Commstar, the <ESCAPE> key is normally re-programmed to generate ASCII 27. This is not true from MOS command level where it will actually generate an Escape condition to allow exit from other ROM commands, tape catalogs etc.

8.3 Programmable Function keys

In addition to the preprogrammed commands stored on the Electron function keys, it is possible to store your own strings/commands under the keys f0 to f9. This is particularly useful for programming identity strings, passwords or command sequences into the soft keys for use during an on-line terminal session. Using the keys in this manner does not affect the other functions as set up by Commstar.

To program a key from within Commstar just use the *KEYn command where n is the number of the key to be programmed. For example :

```
*KEY5 CHARLIE CHAPLIN|@
```

would place the string "CHARLIE CHAPLIN" under function key <f5>. When you wish to send this sequence from <C>hat mode you must press <CTRL-f5> i.e. press <CTRL> and then tap <f5>. Note that in the example there is no Carriage Return character at the end of the string. If required this may be inserted in the usual manner with |M (see User Guide). You must ensure that the string is terminated with |@ so that it can be correctly interpreted by Commstar.

The simplest method of defining a complete set of key definitions and loading them quickly is to define them from BASIC and then *SAVE the soft key buffer :

```
*SAVE KEYS B00 BFF
```

You would then re-load the keys from within Commstar by typing *LOAD KEYS.

Sending strings in this way when Echo is ON will cause them to be sent both to the screen and the RS423. If you wish items such as passowrds to

remain confidential you should switch Echo OFF so that output is to the RS243 only.

You may find that with some computers, strings programmed onto function keys in this manner are sent out too quickly for the remote system to deal with them properly resulting in error conditions. By default Commstar inserts a 0.5 second delay between transmission of each character in the string. If you do encounter problems the delay may be increased by using *FX250,n where n is the number of 0.01 second intervals to be used. For example *FX250,250 would cause a 2.5 second delay.

8.4 Using EXEC files to configure Commstar

If you have a disc interface and drive fitted to your Electron it is a good idea to prepare a 'boot' disc for each system that you use on a regular basis. This is achieved by placing Commstar commands into an EXEC file (usually !BOOT), on a disc using the DFS *BUILD command. Such a file would contain the same commands as you would normally enter from the keyboard. For example :

```
*C*
*FX252,1
*FX250,75              (end each line with <Return>

*LOAD KEYS
AC
```

When EXEC'd this file would switch Commstar on in Terminal mode, configure it to ignore DEL characters, set the function key send delay to 0.75 seconds, load a set of previously defined function key definitions, switch <A>uto Line-feed on and finally go into <C>hat mode.

Using this method you could create a number of different discs suited for use with particular host systems. As another example, the following file could be used to set Commstar up for use with a 1200/75 bulletin board :

```
*C*                    ; switch Commstar on
IRSSSS                 ; <I>nitialise to RX1200, TX75
*LOAD KEYS             ; Load function key definitions
                       ; <RETURN> to command menu
C                      ; Go to <C>hat mode
```

Similarly, other features such as <X>ON/XOFF and <D>isc spooling etc. can be selected so that the process of accessing a remote system can be semi-automated.

8.5 Leaving Commstar

In both Terminal and Prestel mode you may exit Commstar by pressing <CTRL> and <BREAK> simultaneously. This is in fact the cleanest way to exit Commstar because using *BASIC from one of the command menus may leave certain Electron features in an abnormal state e.g. the cursor keys cannot be used for editing.

8.6 The <G>et emulation command

Commstar has been designed to be as flexible as possible, hence the presence on the main menu of the <G>et emulation option. This command has been included in Commstar for the purpose of future expansion to the current ROM based commands. Pressing <G> requests you to enter the name of an "emulation file" which will subsequently be loaded and executed without having to exit Commstar. The files must adhere to a strict format and the process of creating such files is complex and should only be carried out by those people who are conversant with communications and who have the requisite knowledge of 6502 assembly programming.

Appendix A

Glossary of terms

Acoustic modem

An acoustic modem is a modem which has two flexible cups into which a telephone handset can be pushed to provide a coupling between the modem and the telephone line. One of the cups contains a microphone and the other contains a speaker. Data can then be passed between the modem and the telephone system via a normal telephone handset.

This method of coupling lacks reliability due to the interference which may be caused by environmental noise penetrating the cups. Data may be lost or corrupted due to this.

Auto-answer modem

Some types of direct-coupled modem are capable of automatically answering a dialled-in call and setting up the data link. This is referred to as auto-answer. Modems of this type are essential for host systems such as bulletin boards which are left unattended.

Auto-dial modem

A type of direct-coupled modem which is capable of dialling a telephone number under the control of the computer to which it is connected.

Baud rate

The baud rate is an indication of the rate at which data is passed between two communicating devices, the higher the baud rate, the faster the data transfer. An N baud line is one in which the signal level can change N times per second. In most cases there are only two possible signal levels

representing binary 1 and 0. In this case the bit rate is the same as the baud rate. If then, the word length is 10 bits, each word representing one character, the a 300 baud line is capable of transferring 30 characters per second ie 300/10

Bulletin board

A bulletin board is a 'service', usually set up on a micro-computer, that accepts calls via an auto-answer modem. The software that runs the system is generally left unattended and controls access to the facilities that the computer provides. Thus, users may be able to pass messages to each other, download software or even ask the advice of other users.

Communications software

This term is generally used to describe software that allows a micro or other computer to emulate a terminal device. More intelligent communications packages provide facilities, such as selective storage of incoming data or automatic dialling of telephone numbers for use with auto-dial modems, which may not be available on 'dumb' terminals.

Direct connect modem

A type of modem that connects directly into the telephone line via an isolation transformer. These are more reliable than modems of the acoustic type because they are unaffected by environmental noise.

Downloading

The term used to describe the process of transferring data or programs between a user and a host system, via the telephone line.

Host system

A computer which accepts communications from other remote computers or terminals via a suitable transmission medium, usually the public telephone network.

Modem

A device which modulates digital data into a form suitable for transmission over the analogue speech telephone system or demodulates incoming analogue data into digital form.

Parity bit

A parity bit is an extra bit that is sometimes added to a character as a simple form of error check. Parity may be either even or odd. If the parity is odd then the parity bit of a given character will be a 1 if the number of 1 bits in the character is even or 0 if it is odd. ie whatever the number of 1's in the original character, it will be odd following the addition of the parity bit. If even parity is used then the number of 1 bits in the character following the addition of the parity will always be even. Both the receiving and sending equipment must be working on the same parity. If a character is received with an odd number of 1 bits (including the parity bit) when even parity is in use, then it is obvious that an error has been introduced during the transmission.

Protocol

A protocol is the set of rules which both the sending and receiving equipment must obey in order to establish meaningful communication.

RS232 interface

An RS232 interface is a device which converts parallel data into a serial form which may be transmitted over a two or three wire circuit.It provides the link between a computer and a modem. The interface also converts the incoming serial bit stream into parallel form.

The RS232 interface is an international standard for connecting communicating devices. A more recent 'upgrade' of RS232 is the RS423 interface, the type of interface which the BBC computer uses.

Start bits

This is an extra bit added to a data word before transmission so that the receiving equipment recognises the start of the character. The start bit is automatically generated by the sending RS232 interface and then removed by the receiving interface.

Stop bits

During data transfer, 1 or 2 extra bits may be added onto the data word by the RS232 interface so that the receiving equipment can detect the end of the word. These are the 'stop' bits and depending on the quiescent state of the line may be 0's or 1's. The generation of the correct start and stop bits at the sender and then their removal at the receiving equipment, is totally transparent to the user and is carried out by the RS232 interfaces.

Terminal

A device by which a person can communicate with a host system.

Word length

The number of bits which are recognised as comprising a unit of data transfer, a word. This need not be the same as the word length within the computer, extra formatting bits are added during data transfer (stop and start bits).

Xon/Xoff

A simple form of data transfer protocol. If the receiving system wishes to stop the transmission, for example, to transfer the data it has already received on to disc, then it sends an 'XOFF' signal to the host. Once the sender receives an XOFF signal it ceases transmission until it receives an 'XON' from the receiver.

Xmodem

A relatively sophisticated form of file transfer protocol, developed by Ward Christiensen, that allows the transfer of any type of file, either ASCII or binary, without conversion. Complicated error checking is carried out to ensure the integrity of the transferred file.

Appendix B

OSBYTE /*FX call summary

This appendix provides a summary of the *FX/OSBYTE commands available to users with the RS423 cartridge fitted, which are not documented or only paritally documented elsewhere. These calls are accessible either as *FX commands from BASIC or as assembly language OSBYTE calls. Note that the command *FX A,X,Y is equivalent to a call to OSBYTE (&FFF4) with the accumulator set ot A, the X register set to X and the Y register set to Y.

Note that if any of the read/write calls are being used for a read only operation then on entry X must be 255 and Y must be 0. The result value will be returned in X.

*FX2,X - Select computers input stream.

*FX2,0 RS423 input disabled, keyboard selected
*FX2,1 RS423 selected as input
*FX2,2 RS423 input enable, keyboard selected

Note : it is not possible to switch directly from the *FX2,2 state to the *FX2,0 state, *FX2,1 must be issued first and followed by *FX2,0.

```
e.g.  10 FX2,2
      20 REM - program statements here
     500 *FX2,1
     510 *FX2,0
     520 REM - remainder of program
```

*FX3,X - Select computers output stream.

The entry parameter X determines the output devices as follows :

bit	Output selected if bit=1
0	Enable RS423
1	Disable VDU
2	Disable Printer
3	Enable printer independent of VDU2 or 3
4	Disable Spooled output
5	Not used
6	Disable printer output unless sent by VDU,1n
7	Not used.

e.g. *FX3,3 = Enable RS423, disable VDU

*FX5,X - Select printer driver routine.

*FX5,0	Printer dump (characters lost)
*FX5,1	Parallel printer port
*FX5,2	RS423 printer port

*FX7,X - Select receive baud rate.

The baud rates for values of X are as follows :

X	Baud rate
1	75
2	150
3	300
4	1200
5	2400
6	4800
7	9600
8	19200
9	110
10	600
11	1800

*FX8,X - Select transmit baud rate.

The same values of X shown in the table for *FX 7 above may be used in the *FX8 command to set the transmit baud rate.

*FX13,7 - Disable RS423 receive error event

On Exit : A is preserved
X contains the old enable state
(non-zero = enabled)
C is undefined

*FX14,7 - Enable RS423 receive error event.

On exit : A is preserved
X contains the old enable state
(non-zero = enabled)
C is undefined

FX21,X - Flush selected buffer.

X determines the buffer to be flushed as follows :

X	Buffer to be flushed
1	RS423 input buffer
2	RS423 output buffer

*FX138,X,Y - Insert character Y into buffer X.

Examples :

*FX138,1,Y Inserts Y into the RS423 input buffer
*FX138,2,Y Inserts Y into the RS423 output buffer
*FX138,3,Y Inserts Y into the printer buffer

Note that this call is for buffer manipulation only

and does not affect handshaking nor will it cause transmission at the RS423 port.

OSBYTE 145 - Remove character from buffer.

On entry : X defines the buffer as for *FX21.

On exit : A is preserved
Y contains the removed character
C=1 if buffer was empty, otherwise C=0

Note that this call is for buffer manipulation only and does not affect handshaking nor will it cause transmission at the RS423 port.

OSBYTE 146 - Read byte from page &FC

On entry : A contains 146
X contains offset within page &FC

The address to be read is defined as &FC00+X

On exit : A is preserved
Y contains the byte read
C is undefined.

OSBYTE 147 - Write to page &FC

On entry : X contains the offset within page &FC
Y contains the byte to be written
A contains 147

The address to be written to is defined as &FC+X

On exit : A is preserved
C is undefined

OSBYTE 152 - Examine buffer status.

On entry : X contains the buffer number
(1=RS423 input buffer
2=RS423 output buffer)

On exit : A is preserved
X is preserved
Y contains number of characters if not 0
Y is preserved if buffer is empty
C is 1 if buffer empty, otherwise C=0

*FX/OSBYTE 156 - Read/update word format and OS copy.

On entry X contains the selected data format according to the following table and Y contains 227.

X	Data bits	Stop bits	Parity
0	7	2	Even
4	7	2	Odd
8	7	1	Even
12	7	1	Odd
16	8	2	None
20	8	1	None
24	8	1	Even
28	8	1	Odd

e.g. *FX156,16,227 would set the RS423 data format to 8 data bits, no parity and 2 stop bits.

The default setting is *FX156,20,227, any changes become effective immediately after issuing the command. All combinations use 1 start bit.

*FX/OSBYTE 181 - Read/write RS423 mode flag.

On exit : X contains old flag value
Y contains value of next location

When the flag is 0 the input to the RS423 is treated as if it came from the keyboard. <Escapes> are recognised, soft keys are expanded and characters entering the input buffer cause an event. Cursor editing can be performed normally.

If the flag is 1 <Escapes> are ignored, soft keys are not expanded and no events are caused. It is recommended that this flag is used as Read Only as writing it may leave it inconsistent with the OS copy.

OSBYTE 191 - Read/write RS423 use flag.

On entry : Y = 255
X = 0

On exit : X contains old flag value
Y contains contents of next location
Bit 7 set = RS423 free
Bit 7 = RS423 busy
Bits 0-6 are undefined

It is recommended that his call is used for read only purposes as writing may conflict with what the OS thinks is the case.

*FX/OSBYTE 192 - Read RS423 control flag.

On exit : X contains the old flag value
Y contains contents of next location

This call is equivalent to *FX156. However, it is specified as read only because it does not update the 2681 chip. Therefore if it was used to write the control flag it could leave the 2681 and the flag in different states thus causing problems with other calls such as *FX3.

*FX/OSBYTE 232 - Read/write interrupt mask for 2681

On exit : X contains old value
Y contains contents of next location

The default value is &FF. It is recommended that this call is not used for writing as it may conflict with other calls such as *FX3.

*Fx1,0 COMSTAR: Use new Prestel telesoftware protocol.
*Fx1,1 COMSTAR: Use old " " " .

*FX250,0x COMSTAR: Inter-character gap when using *f
function keys in centiseconds.

*FX251,0 COMSTAR: Recognize incoming DEL characters.
*FX251,1 COMSTAR: Ignore " " " .

Appendix C

The 2681 DUART

The integrated circuit which is used in the RS423 cartridge is the SCN2681 DUART. This has two serial ports in it of which only one is used normally in the RS423 cartridge. This is the one from which emerges from the case via the data cable. The other port is available to the user but the Operating system has no provision for addressing it. Therefore the DUART must be accessed using the OSBYTE calls 146 to read and 147 to write. The offset within page &FC is &60 to &6F. The port emerges via four holes on the PCB which are located near the data lead connection. The outputs are labelled 1,2,3 and 4 for 0V, TX, TRS and RX respectively. There is no CTS on the second port.

For further information on the DUART refer to the manufacturers data sheet. As far as use on the Electron is concerned the 2681 addresses are as follows :

	Read	Write
&FC60	(MR1A MR2A)	(MR1A MR2A)
&FE61	(SRA)	(CSRA)
&FE62	(Reserved)	(CRA)
&FE63	(RHRS)	(THRA)
&FE64	(IPCR)	(ACR)
&FC65	(ISR)	(IMR)
&FC66	(CTU)	(CTUR)
&FC67	(CTL)	(CTLR)
&FE68	(MR1B MR2B)	(MR1B MR2B)
&FE69	(SRB)	(CSRB)
&FE6A	(Reserved)	(Reserved)
&FE6B	(RHRB)	(THRB)
&FE6C	(Reserved)	(Reserved)
&FE6D	(Input port)	(OPCR)
&FE6E	(STCC)	(SOPB)
&FE6F	(SPCC)	(ROPB)

The 2681 is not the same chip as used in the BBC but whenever possible the functions of the 6850 used in the BBC have been simulated in software in order to maintain compatibility. In particular these are :

*FX156 has been set up so that the same call allows the user to set up data formats in both machines without changing the parameters. Also, the interrupt bit mask appears the same in both machines.

The 2681 employs a hardware buffer of 3 bytes and the CTS line is asserted by hardware as this buffer fills thus preventing the RS423 cartridge from losing characters at higher baud rates.

Appendix D

Two Useful Programs

Binary to ASCII / ASCII to binary conversion

The following two programs may prove very useful for the transfer of files with Commstar under certain circumstances. Commstar will happily transfer 8 bit data (options 4 to 7 on the initialise menu) but some systems use only 7 bits. As a result they are only able to transfer the normal ASCII character range, binary data or machine code will not transfer correctly because all bytes with a value greater than 127 (&7F) will be #. In order to overcome this limitation binary files must be converted into 'expanded ASCII' for before being transferred. The receiving system may then re-convert the data back into binary form.

The two programs given below are written in BBC Basic and operate on disc files. The first, Listing 1, will convert a binary file from disc into expanded ASCII and create a new file for the expanded data. This may then be transmitted safely to a remote 7-bit system. As an example of what actually happens to the data, a byte with the value &F5 (11110101) in the input file would appear in the converted file as the two byte pair 'F5' i.e. ASCII 70 for 'F' and ASCII 53 for '5'.

Once the program has been correctly typed in, it may be run by typing :

CHAIN <fsp>

where <fsp> is the file specification.

The second program, Listing 2, allows ASCII files such as those created by program 1 to be converted back into binary form. Once again it may be CHAINed.

Listing 1 - BACONV

```
 1 ONERROR PROCerror
10REM ASCII to binary file conversion programme
20REM ========================================
40REM Copyright A.Hood 1984
60CLS
70PRINT' "ASCII to binary disc file conversion"

80INPUT"Source file name ";I$
85I = OPENIN(I$)
90 PRINT
100INPUT"Object file name ";O$
1200 = OPENOUT(O$)
130REPEAT
140     msb=BGET#I
150     lsb=BGET#I
160     PROCbyte
170      BPUT#O,byte
180UNTIL EOF#I
190CLOSE #I
200CLOSE #O
210PRINT CHR$13,"File Converted OK"
220END
240DEFPROCbyte
250lsb$=CHR$(lsb)
260msb$=CHR$(msb)
270byte=(INSTR("0123456789ABCDEF",msb$)-1)*16+(I
NSTR("0123456789ABCDEF",lsb$)-1)
280ENDPROC
300 DEFPROCerror
305 CLS
310 REPORT
315 PRINTTAB(10,20);"PRESS ANY KEY"
318 C=GET
320 RUN
330 ENDPROC
```

Listing 2 - ABCONV

```
 1 ONERROR PROCerror
10REM Binary to ASCII file conversion programme
20REM ----------------------------------------
40REM Copyright A.Hood 1984
60CLS
70PRINT' "Binary to ASCII disc file conversion"

80INPUT"Source file name ";I$
85I = OPENIN(I$)
90 PRINT
100INPUT"Object file name ";O$
1200 = OPENOUT(O$)
130REPEAT
140     byte = BGET#I
150     PROChexstring
160     BPUT#0,msb
170     BPUT#0,lsb
180UNTIL EOF#I
190CLOSE #I
200CLOSE #0
210PRINT CHR$13,"File Converted OK"
220END
240 DEFPROChexstring
250 lsb=ASC(MID$("0123456789ABCDEF",byte-INT(byt
e/16)*16+1,1))
260 msb=ASC(MID$("0123456789ABCDEF",INT(byte/16)
+1,1))
280ENDPROC
300 DEFPROCerror
305 CLS
310 REPORT
315 PRINTTAB(10,20);"PRESS ANY KEY"
318 C=GET
319 CLOSE#0
320 RUN
330 ENDPROC
```

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